

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION VII

KANSAS CITY, KANSAS 66101

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ENVIRONMENTAL PROTECTION
AGENCY-REGION VII
REGIONAL HEARING CLERK

IN THE MATTER OF:

THE DOE RUN RESOURCES
CORPORATION

881 Main Street
Herculaneum, Missouri

Respondent.

Proceedings under Section 7003 of the
Resource Conservation and Recovery
Act as amended, 42 U.S.C. Section 6973;
and
Section 106(a) of the Comprehensive
Environmental Response, Compensation
and Liability Act, as amended,
42 U.S.C. § 9606(a)

Docket No. RCRA-07-2009-0005
CERCLA-07-2009-0010

UNILATERAL ADMINISTRATIVE
ORDER

I. JURISDICTION AND PRELIMINARY STATEMENT

1. This Administrative Order ("Order") is issued to Doe Run Resources Corporation, ("Respondent" or "Doe Run"). Respondent is a New York corporation in good standing doing business in Missouri. This Order is issued pursuant to the authority vested in the Administrator of the United States Environmental Protection Agency ("EPA") by Section 7003(a) of the Resource Conservation and Recovery Act ("RCRA"), 42 U.S.C. § 6973(a), and delegated to the Regional Administrators by EPA Delegation No. 8-22-A.

2. This Order is also issued under the authority vested in the President of the United States pursuant to Section 106 of the Comprehensive Environmental Response, Compensation



and Liability Act, as amended, 42 U.S.C. § 9606 ("CERCLA") and delegated to the Administrator of the EPA on January 23, 1987; by Executive Order No. 12580, and further delegated to the Regional Administrators on September 13, 1987, by EPA Delegation No.14-4-C.

II. STATEMENT OF PURPOSE

3. This Order pertains to the Doe Run owned and operated Herculaneum lead smelter at 881 Main Street in Herculaneum, Jefferson County, Missouri (the "Facility") and residential yards, day-care centers, schoolyards, parks and all other high child impact areas in the vicinity of the Facility that have been or potentially are impacted by releases of lead as a result of the smelter operation and/or transport of lead bearing materials to and from the smelter ("Site"). The Order requires Respondent to conduct certain response actions as detailed in the attached Statement of Work ("SOW"), attached hereto as Appendix A, which in general consist of sampling and analysis of residential properties.

III. PARTIES BOUND

4. This Order applies to and is binding upon Respondent and its officers, directors, employees, agents, successors, assigns, heirs, trustees, receivers, and upon all persons, including, but not limited to, contractors and consultants, acting on behalf of Respondent. Respondent is jointly and severally responsible for carrying out all actions required of it by this Order. Any change in the ownership or corporate status of Respondent including, but not limited to, any transfer of assets or real or personal property shall not alter Respondent's responsibilities under this Order.

5. Respondent shall ensure that its contractors, subcontractors, and representatives receive a copy of this Order and comply with this Order. Respondent shall be responsible for any noncompliance with this Order.

IV. DEFINITIONS

6. Unless otherwise expressly provided herein, terms used in this Order that are defined in the RCRA or CERCLA statutes shall have the meaning assigned to them in that statute.

Whenever the terms listed below are used in this Order the following definitions apply:

"ATSDR" shall mean the Agency for Toxic Substances and Disease Registry.

"CERCLA" shall mean the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended, 42 U.S.C. §§ 9601, *et seq.*

"Concentrate" or "lead concentrate" shall mean a lead production intermediary product, derived from the physical concentration of lead sulfide ore that is comprised of approximately 70 to 80 percent (700,000 to 800,000 parts per million) lead sulfide, otherwise known as galena, which is produced at concentrator or mill facilities. Other metal concentrates, including, but not limited to, copper and zinc concentrates, are also produced.

"Day" shall mean a calendar day unless expressly stated to be a working day.

"Working Day" shall mean a day other than a Saturday, Sunday, or federal holiday. In computing any period of time under this Order, where the last day would fall on a Saturday, Sunday, or federal holiday, the period shall run until the end of the next working day.

"Doe Run facility" shall mean lead smelter located at 881 Main Street in Herculaneum, Missouri.

"Effective Date" shall be the date on which EPA signs this Order.

"EPA" shall mean the United States Environmental Protection Agency and any successor departments or agencies of the United States.

"Facility" shall mean the Doe Run lead smelter as defined in Section 101(9) of CERCLA, 42 U.S.C. § 9601(9).

"Lead-bearing material" shall mean all granular or semi-granular product or waste material which contains more than 400 milligrams per kilogram (mg/kg) of lead.

"Lead concentration" shall mean the proportion of lead in a given material, and is usually measured in parts per million (ppm) or milligrams per kilogram (mg/kg). A measurement in ppm is equal to a measurement in mg/kg.

"Lead loading" shall mean the amount of lead collected from a given area, and is usually measured in milligrams per square foot (mg/ft²).

"MDHSS" shall mean the Missouri Department of Health and Senior Services.

"MDNR" shall mean the Missouri Department of Natural Resources.

"National Contingency Plan" or "NCP" shall mean the National Oil and Hazardous Substances Pollution Contingency Plan promulgated pursuant to Section 105 of CERCLA, 42 U.S.C. § 9605, codified at 40 C.F.R., Part 300, including any amendments thereto.

"Order" shall mean this Unilateral Administrative Order, any amendments thereto, and any documents incorporated by reference into this Order.

"Ore" shall mean the geologic formation rock which is mined and processed in mills, concentrators, and/or smelters to produce lead and other heavy metals.

"Paragraph" shall mean a portion of this Order identified by an Arabic numeral.

"RCRA" shall mean the Resource Conservation and Recovery Act (also known as the Solid Waste Disposal Act), as amended, 42 U.S.C. § 6901, *et seq.*

"Respondent" shall mean The Doe Run Resources Corporation.

"Section" shall mean a portion of this Order identified by a roman numeral, and it may include one or more paragraphs.

"Site" shall mean the Doe Run facility, public roads used to haul concentrate, ore, or other lead-bearing materials in the immediate area of the Facility, residential yards, day-care centers, schoolyards, parks and all other high child impact areas in the vicinity of the Facility that have been or potentially are impacted by releases of lead as a result of the smelter operation and/or transport of lead bearing materials to and from the Facility.

"State" shall mean the State of Missouri.

"Voluntary Property Purchase area" shall mean an area located within approximately 3/8 of a mile of the Doe Run facility which included approximately 160 homes that Doe Run agreed to voluntarily purchase under a settlement with the Missouri Department of Natural Resources.

"Work" shall mean all the activities and requirements specified in this Order.

V. EPA'S FINDINGS OF FACT

7. Respondent owns and operates a primary lead smelter in Herculaneum, Missouri. The smelter is approximately 52 acres in size and is located at 881 Main Street, Herculaneum, Jefferson County, Missouri. It has been operating for over 100 years and is the largest smelter of its kind in the United States.

8. Respondent is a New York Corporation in good standing and doing business in Missouri.

9. Respondent is engaged in the production of lead and other metals from what is commonly known as the New Lead Belt, or the Viburnum Trend, which began producing lead in southeastern Missouri in the mid-1960s and continues production to this day. Ore from the mines is crushed, milled, and processed in order to form lead and other metal concentrates. Lead concentrate commonly contains lead at concentrations greater than 70 percent (700,000 parts per million). This lead concentrate is transported by truck over public roadways approximately 110 miles to the Doe Run facility for smelting and refining.

10. Respondent, or its predecessors, owned and/or operated mining, milling and concentrating facilities in the New Lead Belt since production began there. As of August 1998,

all of the current ore and concentrate mined and hauled in the New Lead Belt is from Respondent's operations.

11. EPA's enforcement-related involvement with the Doe Run facility began over concerns with air emissions, children's elevated blood leads, and elevated lead levels in residential yard soils and home interior dust in Herculanum.

12. Pursuant to Section 108 of the Clean Air Act, the EPA promulgated a National Ambient Air Quality Standard (NAAQS) for lead on October 5, 1978. The standard was 1.5 micrograms of lead per cubic meter of air ($\mu\text{g}/\text{m}^3$) averaged over a calendar quarter. On October 15, 2008, a revised standard of 0.15 microgram of lead in total suspended particles per cubic meter of air on a rolling three month average was promulgated. The area in the vicinity of the Doe Run facility is designated as nonattainment with respect to lead.

13. As required by Section 110 of the Clean Air Act, the State of Missouri developed and submitted for EPA approval State Implementation Plans (SIPs) for lead attempting to attain and maintain the NAAQS and thus control the amount of lead emitted into the air. However, the area continued to fail to attain the standard. By 2000, the Broad Street air monitor in Herculanum had recorded violations of the lead standard in every calendar quarter since that monitor was established in 1992.

14. Doe Run achieved attainment of the NAAQS for lead from the third quarter of 2002 through the fourth quarter of 2004, however, for the first through third quarters of 2005, the Broad Street air monitor in Herculanum again recorded exceedances of the NAAQS for lead. In addition, the NAAQS for lead was exceeded at this monitor for three quarters in 2006, two quarters in 2007 and 1 quarter in 2008. Doe Run and MDNR conducted discussions regarding

proposed control strategies to include in a revised SIP. MDNR revised the Missouri SIP for lead in order to attain the lead NAAQS in Herculaneum. Doe Run has consistently monitored and currently monitors concentrations above the new 0.15 ug/m^3 standard at Herculaneum.

15. The Missouri SIP for lead requires Respondent to implement a Work Practice Manual to address fugitive lead emissions from the Doe Run facility. The Work Practice Manual states that "Temporary sources of dust on paved surfaces outside the plant due to spillage of materials will be addressed so as to limit the reentrainment of those materials. Clean up to consist of those materials being loaded into transfer vehicles.... Final cleanup will incorporate the use of floor sweep compound which will should [sic] adhere to the smaller particles, making them easier to remove." Despite this requirement, dust high in lead was found on the public streets outside the Doe Run facility.

16. In a 1992 Study by the Jefferson County Health Department the blood lead levels of 73 children within 1.5 miles of the Doe Run facility were assessed. Forty (40) of the children showed blood lead levels greater than 10 micrograms per deciliter ($\mu\text{g/dl}$), the level of health concern; 8 children showed blood lead levels greater than $20 \mu\text{g/dl}$; and 2 children showed blood lead levels greater than $30 \mu\text{g/dl}$. From June 1992 to May 1999, documented blood lead levels of 52 children in the vicinity of the Doe Run facility showed blood lead levels greater than $10 \mu\text{g/dl}$ in 15 children and greater than $20 \mu\text{g/dl}$ in 3 children.

17. The Agency for Toxic Substances and Disease Registry ("ATSDR") and Missouri Department of Health and Senior Services ("MDHSS") conducted an Exposure Investigation ("EI") in Herculaneum in 2001 that concluded that the blood lead concentrations of 56% of children screened within $\frac{1}{4}$ mile of the Doe Run facility were elevated above the level of health

concern, 52% of children screened within ¼ and ½ miles of the Doe Run facility were elevated, and 35% of children screened within ½ and ¾ miles of the Doe Run facility were elevated. The EI also concluded that lead in paint and water did not appear to be significant sources of lead exposure in the children studied.

18. Prior to 2000, various soil sampling and analysis projects conducted by Doe Run, its contractors, and the Missouri Department of Health showed lead levels in surface soils of homes surrounding the Doe Run facility as high as 12,800 ppm. According to Doe Run's data, the average concentration of lead in the residential soils within ¼ mile from the Doe Run facility was 3,014 ppm. Natural background levels of lead in agricultural soils in this area (outside the influence of the Doe Run facility) are in the range of 25 to 40 ppm, and EPA's level of concern for residential yards is 400 ppm.

19. In 2001, in response to the exceedances of the NAAQS for lead, elevated blood lead levels in children, and elevated lead levels in residential yards, EPA, MDNR, and Doe Run entered into an Administrative Order on Consent, Docket No. RCRA-7-2000-0018 and CERCLA-7-2000-0029, which required Doe Run to, among other things, install air controls, sample and clean up contaminated residential properties, and perform investigations of the nature and extent of lead, cadmium, and zinc contamination in soil, sediment, surface water, and groundwater.

20. Pursuant to that administrative order, Docket No. RCRA-7-2000-0018 and CERCLA-7-2000-0029, and subsequent additional work and modifications, Doe Run continues to, among other things, sample and replace lead contaminated residential yard soils above 400

parts per million lead in Herculanum. As of January 1, 2009, approximately 501 yards have had contaminated soil replaced with clean soil.

21. In addition, in April 2002, MDNR entered into a Settlement Agreement with Doe Run which, among other things, established the Herculanum Voluntary Property Purchase Plan. It required Doe Run to make purchase offers to approximately 160 homeowners living within the designated Voluntary Property Purchase area, comprised of a specified area within approximately 3/8 of a mile of the Doe Run facility. As of January 2006, twenty-nine homeowners chose not to accept purchase offers for their properties, and those properties remain occupied by those residents.

22. For the last several years, the primary mode of transporting ore, concentrate, and/or lead bearing materials between the Doe Run facilities has been by trucks using public roads and streets. The primary haul route through the City of Herculanum used by trucks traveling to and from the Doe Run facility goes through residential areas and includes portions of Station Street, Brown Street, and Joachim Avenue. A secondary haul route is also used, which includes portions of Main Street and Joachim Avenue. Numerous residences are located along the hauling routes.

23. In August 2001, MDNR personnel responded to citizens' complaints about dust coming off trucks on their way to and from the Doe Run facility and dust in long, narrow piles along the haul route streets in Herculanum. Samples taken by MDNR from the primary haul route along Station Street were as high as 300,000 ppm of lead. EPA sampling and analysis confirmed the existence of high levels of lead on the streets in Herculanum used by Doe Run as haul routes, and also showed that many residential yards and parks along the haul routes

contained higher levels of lead than those located in the same general area but not along a haul route. A number of residences along the haul routes had levels of lead in soil greater than 10,000 ppm. Sampling and analysis of road shoulders adjacent to residential yards along the haul route revealed lead concentrations in several samples in the 20,000 to 40,000 ppm range, with two as high as 74,500 ppm and 96,800 ppm.

24. In response to the high levels of lead on and along the hauling routes in Herculaneum, on September 25, 2001, MDNR issued an Order to Abate and Cease and Desist Violations ("Cease and Desist Order") to Doe Run, requiring that Doe Run, among other things, ensure that all trucks and other vehicles leaving the facility are clean and free of lead concentrate and slag dust, take all steps necessary to ensure that every vehicle is free of material which could cause fugitive emissions or contaminate roads, and clean haul routes in Herculaneum. After an appeal by Doe Run, the Cease and Desist Order was resolved through an April 2002 Settlement Agreement, between MDNR and Doe Run, which required, among other things, modifications to, and implementation of, a Transportation and Materials Handling Plan addressing the above actions.

25. In December 2001, in response to the high levels of lead in the Herculaneum streets used as haul routes, high levels of lead in residential yards along the haul routes, and high levels of lead in residential interior dust, EPA and Doe Run entered into an Administrative Order on Consent, Docket No. CERCLA-07-2002-0038 for the Herculaneum Lead Smelter Site, which required Doe Run to, among other things, expedite residential soil cleanups for yards with very high levels of lead and where children reside, conduct interior dust cleanups, and develop and

implement a Smelter Transportation and Materials Handling Plan to minimize, using best management practices, the release of lead to the community as a result of Doe Run's activities.

26. "The Doe Run Herculanum Smelter Transportation Plan and Materials Handling Plan" was approved by EPA in July 2003, and sets forth, among other things, traffic zones and flow within the smelter to reduce track-out of lead contamination, operation of an automated undercarriage truck wash for vehicles to use prior to leaving the smelter, operation of dry street sweepers within Herculanum, and a spill response policy.

27. Pursuant to the EPA administrative order, Docket No. CERCLA-07-2002-0038, Doe Run continues to, among other things, implement the EPA-approved Transportation Plan and Materials Handling Plan, including operation of the automated undercarriage truck wash and street sweeping.

28. In 2003 and 2004, street sampling and analysis at locations in Herculanum at Station and Main Streets in the inbound traffic lanes (toward the Doe Run facility) indicated lead concentrations of 2,582 ppm and lead loadings of 0.854 mg/ft². Sampling and analysis at locations at Station and Main Streets in the outbound traffic lanes (away from the Doe Run facility) indicated lead concentrations of 9,261 ppm and lead loadings of 1.92 mg/ft² in 2003 and 2004.

29. In 2004, the Joachim Avenue bridge was closed to truck traffic, meaning that truck traffic is using the Main Street haul route as the primary haul route to and from the Doe Run facility. The Main Street haul route passes through occupied residential neighborhoods outside the scope of MDNR's Voluntary Property Purchase area.

30. A road edge soil sample collected on March 22, 2004, from a residence along the

haul route in Herculeaneum approximately 875 feet from the Doe Run facility, revealed a lead concentration of 2,003 ppm. The road shoulder soil was previously excavated and replaced in January 2002. Replacement soil is required by EPA to be below 240 ppm lead, but was generally below 100 ppm lead in all locations.

31. On November 16, 2004, MDNR disapproved Doe Run's Transportation and Materials Handling Plan due to ongoing lead deposition along haul routes in Herculeaneum, and Doe Run's failure to address MDNR's comments on the Plan.

32. Street sampling and analysis results from samples collected by EPA on November 7, 2005, from the exit road of the vehicle wash station at the Doe Run facility revealed a lead concentration of 233,000 mg/kg and a lead loading of 20.5 mg/ft². Street sampling and analysis on the same date from the outbound traffic lane from the Doe Run facility at Main Street and Curved Street revealed a lead concentration of 185,000 mg/kg and a lead loading of 12 mg/ft².

33. All of the street samples collected in the outbound lane (from the Doe Run facility) at Main and Station Streets in 2005, were above 55,000 ppm lead concentration and 3.00 mg/ft² lead loading, with the highest sample showing a lead concentration of 174,000 ppm and a lead loading of 9.92 mg/ft².

34. Outside the immediate area of the Doe Run facility, three out of four of the street samples collected in the outbound lane in front of 543 Main Street in 2005, were above 22,300 ppm lead concentration and all the samples were above 2.9 mg/ft² lead loading.

35. Respondent's concentrate, ore, and lead bearing materials on and along the publicly traveled streets used to haul those materials in Herculeaneum is available for direct human exposure and may migrate and be tracked into nearby residents' yard and homes.

36. In May 2007, in response to many of the transportation issues, EPA and Doe Run entered into an Administrative Order on Consent, Docket No. RCRA-07-2007-0006 for the Transportation and Haul Routes, Southeastern Missouri, which required Doe Run to, among other things, construct vehicle wash stations at all Doe Run facilities where concentrate, ore or lead-bearing materials are transferred on or off vehicles, perform roadway and street washing around these facilities, perform sampling and analysis at certain residential properties and along roadways where the lead-bearing materials are being transported and report the results of these activities to EPA.

37. Analysis of the potential hazard to humans from ingestion of lead depends on accurate information on a number of key parameters, including lead concentration in environmental media, intake rates of each medium, and the rate and extent of lead absorption by the body from an ingested medium, or "bioavailability". Knowledge of lead bioavailability is important because the amount of lead that actually enters the body from an ingested medium depends on the physical-chemical properties of the lead and of the medium.

38. Bioavailability is typically measured as the fraction or percentage of lead that is absorbed by the body following an exposure of some specified amount, duration, and route, usually oral. Bioavailability of lead may be expressed as absolute bioavailability or relative bioavailability. Absolute bioavailability (ABA) is the ratio of the amount of lead absorbed compared to the amount ingested. Relative bioavailability (RBA) is the ratio of the ABA of lead present in some test material compared to the ABA of lead in a reference material, usually lead acetate, which is expected to completely dissolve when ingested.

39. When reliable site-specific data are lacking, EPA typically employs a default RBA

value of 60% for lead in soil or dust compared to soluble lead in water, for both children and adults, in evaluating potential risks to human health from ingestion of the soil or dust and computing risk-based cleanup levels. If site-specific data reveals that the RBA for lead in soil or dust is higher than 60%, this indicates that absorption of, and hazards from, lead in that soil or dust is higher, and site-specific cleanup levels may need to be adjusted downward.

40. In May 2002, Doe Run released results of its "Haul Road Risk Assessment" for Herculaneum. The Risk Assessment was prepared by Doe Run to evaluate the human health risks from exposure to lead in street dust along the haul roads used by the trucks hauling concentrate to the Doe Run facility. The Risk Assessment concluded that the RBA of concentrate was 1%, street dust lead concentrations of 95,000 ppm were protective of human health, and street dust lead concentrations did not pose a significant health risk for adult or child pedestrians along the haul routes in Herculaneum.

41. EPA and MDHSS expressed a number of concerns with the validity of Doe Run's Risk Assessment, including flaws in the methodology, incomplete documentation, calculation errors, and inappropriate sample inputs for modeling. Both agencies expressed concern with the fact that the assessment was restricted to a single exposure pathway, that is, direct exposure to concentrate in the road, without considering the cumulative risk associated with exposure to other media such as lead-contaminated yard soil and house dust.

42. Beginning in September 2004, EPA conducted a bioavailability analysis of lead from a composite of interior house dust samples collected from several Herculaneum residents' vacuum bags, and a composite of soil samples collected from several Herculaneum residential yards. The bioavailability study, finalized in May 2005, revealed that the house dust had a RBA

of 52%, and the soil had a RBA of 97%.

43. EPA conducted a second bioavailability study to further examine whether lead concentrate transforms in the soil environment to a more bioavailable form. In this study, fill dirt used in the remediation of residential properties in Herculaneum was mixed with concentrate delivered to the Doe Run facility, and the concentrate-soil mixture was allowed to weather in nearby off-site soil plots. Bioavailability results conclude that the concentrate-soil mixture had a RBA of 82% after one year of exposure to the environment.

44. In conjunction with the 2005 bioavailability analysis, EPA conducted a lead characterization study, or "speciation" study, on the Herculaneum community and Doe Run facility media in order to determine the sources of lead in residential contaminated soils and interior house dusts surrounding the Doe Run facility. Samples were collected from residential yards, residents' vacuum bags (which were also used for the 2005 bioavailability analysis), and roadsides, and compared with samples from inside the Doe Run facility, slag piles, and haul routes.

45. Speciation results from smelter operation samples, including concentrate, slag, and baghouse dust, revealed a predominance of galena (PbS), cerussite (PbCO_3), anglesite (PbSO_4), anglesite+ ($\text{Pb}_{1-x}\text{SO}_4\text{-OH}$), native lead (Pb), and lead oxide (PbO).

46. Roadside and residential interior dust sample lead masses were dominated by galena, cerussite, and anglesite. Residential soil sample lead masses were dominated by galena, cerussite, manganese hydroxide, and phosphates. The residential soils contain source-traceable lead forms similar to those observed in interior dust samples, however, the "soil interacting" forms, manganese oxide, iron oxide, and phosphate, are more prevalent as is typical in developed

soil environments. These compounds are the result of soluble lead sorbing onto manganese, iron, and/or phosphorus minerals in soils.

47. The speciation study report concludes that the roadside, residential interior dust, and residential soil samples all contain source-traceable lead forms from activities associated with smelter operations, including smelter-stack emissions, fugitive emissions from hauling and storage, and waste and concentrate spillage.

48. The speciation study report also concludes that neither paint nor gasoline is a significant lead contributor in Herculaneum. The report explains that speciation analyses cannot rule out leaded gasoline as a possible lead source, since the forms of lead emitted from leaded fuels are generally very soluble and would have released their lead to be sorbed onto the "soil interacting" forms. However, a number of factors suggest that this is unlikely to be a significant lead source: (1) numerous studies have shown that soil-lead concentrations from gasoline diminish rapidly to background levels within a few meters distance from a major road; (2) some studies have further shown that unless traffic volumes are large, greater than 5000 vehicles per day, lead concentrations above background are not found; (3) traceable forms of lead that are found in residential soils are related to the Doe Run facility; and (4) residential lead concentrations are significantly greater than similar-size communities that have no mining/milling/smeltering activities.

49. The ATSDR has concluded that exposure to lead can have adverse health effects on multiple human organ systems. Exposure to lead can affect adults, but children less than six years old, and unborn children whose mothers are exposed to lead, are especially vulnerable to the effects of lead poisoning. In children, the ATSDR has concluded that lead can cause adverse

health effects on the central nervous system. Medical literature has reported an association between lead exposure and reduced intelligence quotient scores. Humans may be exposed to lead through ingestion of contaminated soils and dust or by inhalation of lead particles in the air.

Lead has many toxic effects on human health and is a cumulative toxicant. A significant amount of lead that enters the body is stored in the bone for many years and can be considered an irreversible health effect.

50. EPA and MDNR have continued to monitor soil lead levels in previously excavated residential yards and road shoulders, lead levels in streets, residential interior dust, and air monitoring data within Herculaneum. Analysis of the soil data monitored by EPA shows a statistically significant upward trend in lead levels in residential surface soils within 0.8 miles of the Doe Run facility, and with many samples revealing lead concentrations above 400 ppm, EPA's level of concern. Indications are that recontamination is occurring beyond MDNR's Voluntary Property Purchase area.

51. In June 2009, Doe Run provided to EPA the results of the residential yard sampling and analysis and road edge sampling and analysis conducted by Doe Run on properties in the area of the Doe Run facility. Of the 37 residential properties sampled in 2008 and 2009, 25 properties had lead concentrations in at least one sample above EPA's level of concern of 400 ppm, and 20 of these properties had already been cleaned up at least one time. Of the 134 road edge samples, 118 had lead concentrations above 400 ppm, with a high soil lead concentration of 31,333 ppm.

52. In a letter dated, September 29, 2008, in response to continuing upward trends in soil lead levels in residential yards in Herculaneum, EPA recommended that Respondent sample all

residential properties within one mile of the Doe Run facility on a regular basis. Doe Run has not performed additional sampling and analysis of all residential properties within one mile of the Doe Run facility. The June 2009 data results confirm the upward trend in soil lead levels in residential yards in Herculaneum.

VI. CONCLUSIONS OF LAW AND DETERMINATIONS

53. Respondent is a "person" as defined in Section 1004(15) of RCRA, 42 U.S.C. § 6903(15), and Section 101(21) of CERCLA, 42 U.S.C. § 9601(21).

54. The Site, including those residential properties located within one mile of the Herculaneum lead smelter, is a "facility" within the meaning of Section 101(9) of CERCLA, 42 U.S.C. § 9601(9).

55. The Lead concentrate, ore, and other lead-bearing materials on the public roads, road-sides and residential yards surrounding the Doe Run facility is discarded material, and thus a "solid waste" as defined in Section 1004(27) of RCRA, 42 U.S.C. § 6903(27).

56. The Lead concentrate, ore, and other lead-bearing materials on the public roads, road-sides and residential yards surrounding the Doe Run facility are "hazardous substances" as defined by Section 101(14) of CERCLA, 42 U.S.C. § 9601(14).

57. The presence of solid wastes in the residential yards and along the roads resulted from the past or present handling, storage, treatment, transportation, and/or disposal of solid wastes.

58. Present conditions at the Site may present an imminent and substantial endangerment to human health and/or the environment within the meaning of Section 7003(a) of RCRA, 42 U.S.C. § 6973(a).

59. The conditions at the Site described in the Findings of Fact above constitute an actual or threatened release of hazardous substances from the facility as defined in Section 101(22) of CERCLA, 42 U.S.C. § 9601(22).

60. Respondent has contributed or is contributing to the handling, transportation, or disposal of solid wastes at the Site within the meaning of RCRA and its implementing regulations.

61. The actual or threatened release of hazardous substances from the Site may present an imminent and substantial endangerment to the public health, welfare, or the environment within the meaning of Section 106(a) of CERCLA, 42 U.S.C. § 9606(a).

62. The actions required by this Order are necessary to protect public health, welfare, or the environment and are not inconsistent with the NCP, 40 C.F.R., Part 300, and CERCLA.

63. Respondent is the "owner" of a facility within the meaning of Section 107(a)(1) and 107(a)(2) of CERCLA, 42 U.S.C. §§ 9607(a)(1) and 9607(a)(2).

VII. NOTICE TO STATE AND LOCAL AUTHORITIES

64. The State of Missouri and appropriate local authorities have been notified of the issuance of this Order pursuant to Section 7003(c) of RCRA, 42 U.S.C. § 6973(c) and Section 106(a) of CERCLA, 42 U.S.C. § 9606(a).

VIII. ORDER

65. Based upon the foregoing, Respondent is hereby ORDERED to perform the activities described in Section IX of this Order and all other activities required by this Order.

IX. WORK TO BE PERFORMED

66. Notice of Intent to Comply. Respondent shall notify EPA in writing within seven (7)

days of the Effective Date of this Order of Respondent's irrevocable intent to comply with this Order pursuant to Section XIV below. Failure of Respondent to provide such notification within this time period shall be a violation of this Order.

67. Project Coordinator. Respondent shall notify EPA in writing within five (5) days of the Effective Date of this Order of the name, address, phone number, electronic mail address, and qualifications of its Project Coordinator, who shall be responsible for administration of all the Respondent's actions required by this Order. The EPA Project Coordinator will be Jim Aycock. Respondent shall direct all submissions required by this Order to Mr. Aycock at U.S. EPA, Region 7, 901 N. 5th Street, Kansas City, Kansas 66101. Copies of all submissions required by this Order shall be sent to Mr. Tom Judge, Missouri Department of Natural Resources, Hazardous Waste Program, P.O. Box 176, Jefferson City, Missouri 65102-0176. Each Project Coordinator shall be responsible for overseeing the implementation of this Order. EPA and Respondent have the right to change their respective Project Coordinators. The other party must be notified in writing at least ten (10) days prior to the change. EPA retains the right to disapprove of any Project Coordinator named by Respondent. If EPA disapproves of a selected Project Coordinator, Respondent shall retain a different Project Coordinator and shall notify EPA of that person's name and qualifications within two (2) working days following EPA's disapproval. Receipt by Respondent's Project Coordinator of any notice or communication from EPA relating to this Order shall constitute receipt by Respondent.

68. Sampling and Reporting. Respondent shall sample for lead in the surface soil and gravel driveways of all occupied residential properties in Herculaneum, Missouri that are located within a 1 mile radius of the Doe Run facility in Herculaneum, Missouri in accordance with the

attached SOW (Appendix A). Within fourteen (14) days of the Effective Date of this Order, Respondent shall begin sampling and analysis of the residential properties. Respondent shall complete this sampling and analysis within sixty (60) days of the Effective Date of this Order. Respondent shall provide the results of the sampling and analysis in a report to EPA within 90 days of the Effective Date of the Order (30 days after completion of sample collection). All sampling and analysis shall be conducted consistent with the Quality Assurance Project Plan (QAPP) attached to this Order as Appendix B.

69. Contractors. Respondent shall perform the Work itself, or retain one or more contractors to perform the Work. Should Respondent elect to conduct the Work itself, it shall notify EPA of its qualifications to perform the Work within seven (7) days of the Effective Date of this Order. Should Respondent retain a contractor to conduct the Work, Respondent shall notify EPA of the name and qualifications of each contractor within seven (7) days of the Effective Date of this Order. Respondent shall also notify EPA of the name and qualifications of any other contractor or subcontractor retained to conduct any portion of the Work under this Order at least two (2) days prior to commencement of such portion of the Work. EPA retains the right to disapprove of any party Respondent selects to conduct the Work. If EPA disapproves of Respondent's selection, Respondent shall propose a different party to perform the Work and shall notify EPA of the name and qualifications of that party within two (2) working days of EPA's disapproval.

70. Respondent shall undertake and complete all of the Work to the satisfaction of EPA, pursuant to RCRA § 7003, 42 U.S.C. § 6973. All of the Work performed under this Order shall be under the direction and supervision of Respondent's Project Coordinator and shall be in

accordance with the terms of this Order.

71. The Work undertaken pursuant to this Order shall be conducted in compliance with all applicable federal and state requirements, EPA guidances, policies and procedures, and with this Order, and is subject to EPA approval.

72. Health and Safety Plan. Respondent shall develop a Health and Safety Plan for review by EPA. It shall be implemented during the Work performed under this Order. The Health and Safety Plan shall comply with applicable Occupational Safety and Health Administration (OSHA) regulations.

73. In addition to the actions described above, Respondent shall continue to implement the actions required by Administrative Order on Consent, Docket No. CERCLA-07-2002-0038, Administrative Order on Consent, Docket No. RCRA-7-2000-0018, and CERCLA-7-2000-0029, and Administrative Order on Consent, Docket No. RCRA-07-2007-0008.

74. Deliverables. EPA will review Respondent's plans, reports, and any other documents submitted pursuant to this Order ("deliverables"), and will notify Respondent in writing of EPA's approval or disapproval of each such deliverable. In the event of EPA's disapproval, EPA shall specify in writing any deficiencies in the submission. Respondent shall modify the submission to incorporate EPA's comments, and shall submit the amended deliverable to EPA within fifteen (15) days. Upon resubmission, EPA, in its sole discretion, may either approve the document, or if EPA determines that the document does not adequately address the comments provided by EPA, EPA may unilaterally modify the document, and will provide Respondent with a copy of the document as modified by EPA, to be implemented in accordance with any modifications. If, upon resubmission, a document, or portion thereof, is unilaterally modified by EPA, Respondent

will be deemed to have failed to submit such plan, report, or document timely and adequately and as a result, may be in violation of this Order.

75. All deliverables required to be submitted to EPA under this Order, shall, upon approval or modification by EPA, be incorporated into and be enforceable under this Order. In the event EPA approves or modifies a portion of a deliverable required to be submitted to EPA under this Order, the approved or modified portion shall be enforceable under this Order.

76. Quality Assurance. Respondent shall perform the Work consistent with the QAPP attached to this Order. This QAPP was developed for site characterization of residential properties in Herculaneum, Missouri. The original document was prepared in 2001 and has been updated in 2007 and 2009.

77. All sampling and analyses performed pursuant to this Order shall conform to EPA direction, approval, and guidance regarding sampling, quality assurance/quality control ("QA/QC"), data validation, and chain of custody procedures in accordance with the appropriate EPA guidances, including "EPA Requirements for Quality Assurance Project Plans for Environmental Data Operations" (EPA QA/R5. EPA/240/B-01/003 (March 2001)) and "Guidance for Quality Assurance Plans" (EPA QA/G5. EPA/240/R-02/009 (December 2002)), as well as any other such applicable guidance identified by EPA.

78. Split Samples. Upon request by EPA, Respondent shall allow EPA or its authorized representatives to take split or duplicate samples of any samples collected by Respondent while performing Work pursuant to this Order. EPA shall have the right to take any additional samples that it deems necessary.

79. Respondent shall ensure that all laboratories it uses for analyses participate in a QA/QC program equivalent to the program that EPA follows. Respondent shall, upon EPA's request, make arrangements for EPA to conduct a performance and QA/QC audit of the laboratories chosen by Respondent, whether before, during, or after sample analyses. Upon EPA's request, Respondent shall have its laboratories perform analyses of samples provided by EPA to demonstrate laboratory QA/QC and performance. If the audit reveals deficiencies in a laboratory's performance or QA/QC, Respondent shall submit a plan to address the deficiencies and EPA may require resampling and additional analysis.

80. Site Access. Pursuant to Section 3007(a) of RCRA, 42 U.S.C. § 6927(a), Respondent shall provide access to the Site at reasonable times to EPA, EPA's contractors and oversight officials. Respondent shall also provide access at reasonable times to EPA, EPA's contractors and oversight officials to all records and documentation in its possession or control, including those records and documents in the possession or control of Respondent's contractors and employees, related to the conditions at the Site and the actions conducted pursuant to this Order. Respondent shall use its best efforts to gain access to areas owned by or in the possession of someone other than Respondent, as necessary to implement this Order, as described in Paragraph 82. Such access shall be provided to EPA, its contractors and oversight officials. These individuals shall be permitted to move freely about the Site and appropriate off-site areas in Order to conduct actions, including, but not limited to, sampling and analysis, that EPA determines to be necessary. EPA, its contractors and oversight officials shall notify Respondent of their presence on the Site by presenting their credentials. All parties with access to the Site under this paragraph shall comply with all health and safety plans and regulations.

81. Pursuant to this Section, any denial of access by Respondent at reasonable times to any portion of the Site property where a request for access was made for the purposes of enforcing the requirements of RCRA or this Order shall be construed as a violation of the terms of this Order.

82. Access Agreements. Where action under this Order is to be performed in areas owned by, or in possession of, someone other than Respondent, Respondent shall use its best efforts to obtain all necessary access agreements within two (2) days of performing any Work for which access is necessary or as otherwise specified, in writing, by the EPA Project Coordinator. Any such access agreement shall provide for access by EPA and its representatives to move freely in order to conduct actions that EPA determines to be necessary. The access agreement shall specify that Respondent is not EPA's representative with respect to any liabilities associated with activities to be performed. Respondent shall provide EPA's Project Coordinator with copies of any access agreements. Respondent shall immediately notify EPA if after using Respondent's best efforts it is unable to obtain such agreements within the time required. Best efforts as used in this paragraph shall include, at a minimum, a certified letter from Respondent to the present owner of such property requesting access agreements to allow Respondent, EPA, and EPA's authorized representatives to enter such property, and the offer of payment of reasonable sums of money in consideration of granting access. Respondent shall, within five (5) days of its receipt of a denial of access, submit in writing to EPA, a description of its efforts to obtain access. EPA may, at its discretion, assist Respondent in obtaining access. In the event EPA obtains access, Respondent shall undertake the Work on such property.

X. RECORD RETENTION

83. Until ten (10) years after Respondent's receipt of EPA's notification pursuant to Section XIX (Modification and Termination) of this Order, Respondent shall preserve and retain all non-identical copies of records and documents (including those in electronic form) which relate in any manner to the performance of the Work required under this Order. Respondent shall also instruct its contractors and agents to preserve all such documents for a period of ten (10) years.

XI. OPPORTUNITY TO CONFER

84. The Respondent may, within three (3) days after the Effective Date of this Order, request a conference with EPA to discuss this Order. The conference must be scheduled to occur on or before July 13, 2009.

85. The purpose and scope of the conference shall be limited to issues involving the implementation of the Work required by this Order and the extent to which Respondent intends to comply with this Order. This conference shall not constitute an evidentiary hearing, and shall not constitute a proceeding to challenge this Order. Any such conference shall not give Respondent a right to seek review of this Order, or to seek resolution of potential liability, and no official stenographic record of the conference shall be made. Respondent may appear in person or by an attorney or other representative at any conference held pursuant to Respondent's request hereunder. A request for a conference with EPA does not in any way delay or continue any of the deadlines or Work to be performed by the Respondent.

86. Requests for a conference shall be made by telephone followed by written confirmation mailed by the following business day to the EPA Project Coordinator.

XII. COMPLIANCE WITH OTHER LAWS

87. Respondent shall perform all actions required pursuant to this Order in accordance with all applicable local, state, and federal laws and regulations. Respondent shall obtain or cause its representatives to obtain all permits and approvals necessary under such laws and regulations in a timely manner so as not to delay the Work required by this Order.

XIII. EMERGENCY RESPONSE AND NOTIFICATION OF RELEASES

88. In the event of any action or occurrence during the performance of the Work which causes or threatens a release of hazardous waste or hazardous substances from the Site that constitutes an emergency situation or may present an immediate threat to public health or welfare or the environment, Respondent shall immediately take all appropriate action to minimize such emergency or threat in accordance with all applicable provisions of this Order, and shall immediately notify the EPA's Project Coordinator. Respondent shall take such immediate and appropriate actions in consultation with EPA's Project Coordinator. In the event that Respondent fails to take appropriate response action as required by this paragraph, and EPA takes such action instead, EPA reserves the right to pursue cost recovery.

89. In addition, in the event of any release of a hazardous substance from the Site, Respondent shall immediately notify the EPA Regional Spill Line at (913) 281-0991 and the National Response Center at (800) 424-8802. Respondent shall submit a written report to EPA within seven (7) days after each release, setting forth the events that occurred and the measures taken or to be taken to mitigate any release or endangerment caused or threatened by the release and to prevent the reoccurrence of such a release. This reporting requirement is in addition to, not in lieu of, reporting under Section 103(c) of CERCLA, 42 U.S.C. § 9603(c) and Section 304

of the Emergency Planning and Community Right-to-know Act of 1986, 42 U.S.C. 42 U.S.C. § 11004 *et seq.*

XIV. NOTICE OF INTENT TO COMPLY

90. Respondent shall provide, within seven (7) days after the effective date of this Order, written notice to EPA stating whether Respondent will comply with the terms of this Order. The notice shall be sent to EPA's Project Coordinator. If Respondent does not unequivocally commit to perform the Work required by this Order, Respondent shall be deemed to have violated this Order and to have failed or refused to comply with this Order. The absence of a response by EPA to the notice required by this paragraph shall not be deemed to be acceptance of any Respondent's assertions.

XV. ENFORCEMENT AND RESERVATIONS

91. The United States reserves the right to bring an action against Respondent pursuant to CERCLA for recovery of any costs incurred by the United States related to this Order.

92. Notwithstanding any other provision of this Order, EPA reserves the right to perform its own studies, complete the Work (or any portion of the Work) required by this Order, and seek reimbursement from Respondent for its costs, or seek any other appropriate relief.

93. Nothing in this Order shall preclude EPA from taking any additional enforcement actions, including modification of this Order or issuance of additional Orders, and/or additional actions as EPA may deem necessary, or from requiring Respondent in the future to perform additional activities pursuant to RCRA, or CERCLA, or any other applicable law. Such additional enforcement actions may include, but are not necessarily limited to: actions taken pursuant to Section 3008(a) of RCRA, 42 U.S.C. § 6928(a), to assess civil penalties and/or seek

injunctive relief; and further actions under Section 7003 of RCRA to address conditions that may present an imminent and substantial endangerment to human health or the environment caused by any future releases of solid waste or hazardous waste from the Doe Run facility. In addition, Respondent shall be subject to civil penalties of up to \$7,500 per day for any violation of this Order under 7003(b) of RCRA, 42 U.S.C. § 6973(b).

94. Notwithstanding any provision of this Order, the United States hereby reserves all of its information gathering, inspection and all enforcement authorities and rights under RCRA, CERCLA, and any other applicable statutes or regulations. The United States expressly reserves all rights it has to issue additional orders or to take other action it deems necessary or appropriate to address any other areas of the Site or Facility which the United States deems a threat to human health or the environment.

95. Respondent may be subject to civil penalties of up to \$37,500 per day for any violation of this Order under Section 106(b)(1) of CERCLA, 42 U.S.C. § 9606(b)(1). Respondent may also be subject to punitive damages in an amount up to three times the amount of any costs incurred by the United States as a result of such violation, as provided in Section 107(c)(3) of CERCLA, 42 U.S.C. § 9607(c)(3). In addition, EPA may carry out the required actions unilaterally, pursuant to Section 104 of CERCLA, 42 U.S.C. § 9604. All penalties shall begin to accrue through the final day of correction of the noncompliance.

96. Nothing in this Order shall constitute or be construed as a release from any claim, cause of action or demand at law or in equity against any person for any liability arising out of or relating in any way to the Doe Run facility.

97. If a court issues an order that invalidates any provision of this Order or finds that Respondent has sufficient cause not to comply with one or more provisions of this Order, Respondent shall remain bound to comply with all provisions of the Order not invalidated by said court order.

98. Except as specifically provided in this Order, nothing herein shall limit the power and authority of EPA to take, direct, or order any and all actions necessary to protect public health, welfare, or the environment or to prevent, abate, or minimize an actual or threatened release of hazardous substances, pollutants, or contaminants, or hazardous or solid waste or constituents of such wastes, on, at, or from the Site. Further, nothing herein shall prevent EPA from seeking legal or equitable relief to enforce the terms of this Order, from taking other legal or equitable action as it deems appropriate and necessary, or from requiring Respondent in the future to perform additional activities pursuant to CERCLA or any other applicable law. The EPA reserves, and this Order is without prejudice to, all rights against Respondent with respect to all other matters, including, but not limited to:

- a. claims based on a failure by Respondent to meet a requirement of this Order;
- b. liability for costs incurred by EPA for the performance of the Work required under this Order in the event that Respondent fails to perform the Work, in addition to any response costs incurred by EPA associated with responding to a release or threatened release of hazardous substances at or from the Site or Facility;
- c. liability for performance of response action(s) other than the Work required by this Order;
- d. criminal liability;

e. liability for damages to, destruction of, or loss of natural resources, and for the costs of any natural resource damage assessments;

f. liability arising from the past, present, or future disposal, release or threat of release of hazardous wastes or hazardous substances from the Site; and

g. liability for costs incurred or to be incurred by the Agency for Toxic Substances and Disease Registry related to the Site.

XVI. SAMPLING AND ACCESS

99. The EPA, MDNR, and/or its authorized representative shall have access to the Site at all reasonable times for the purpose of reviewing the progress of Respondent in carrying out the provisions of this Order and for purposes including, but not limited to, inspecting and copying records, collecting samples, and verifying data. Nothing in this Order shall restrict EPA's rights under Section 3007 of RCRA, 42 U.S.C. § 6927, and CERCLA, or other statutory authority.

XVII. EFFECTIVE DATE AND COMPUTATION OF TIME

100. This Order shall become effective immediately upon signature. All times for performance of ordered activities shall be calculated from this effective date.

XVIII. ADMINISTRATIVE RECORD

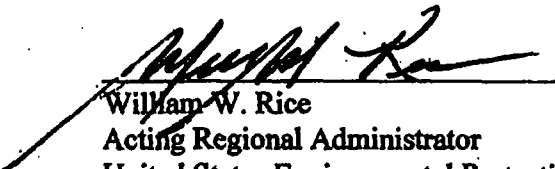
101. The EPA has established an Administrative Record which contains the documents that form the basis for the issuance of this Order. It is available for review by appointment on weekdays between the hours of 8:30 a.m. and 4:00 p.m. at the offices of EPA, Region 7, located at 901 N. 5th Street, Kansas City, Kansas 66101. To review the Administrative Record, please contact EPA's Project Coordinator.

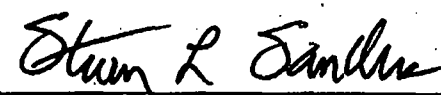
XIX. MODIFICATION AND TERMINATION

102. The EPA may modify or revoke this Order based upon information discovered during the course of implementation of the Order. Any modification shall be incorporated into a revised Order and issued to Respondent in the form of a modified Unilateral Administrative Order. The provisions of this Order shall remain in full force and effect until all actions required by this Order have been completed and EPA has notified the Respondent, in writing, that the actions required by this Order have been completed. Respondent shall notify EPA in writing at such time as it believes that all such actions have been completed. The EPA shall have sole discretion in determining whether or not all such actions have in fact been completed. Failure to complete all activities required hereunder as directed by EPA shall be deemed a violation of this Order. The EPA's provision of written notice to Respondent pursuant to this paragraph shall not be construed as a waiver of any of EPA's rights to take further enforcement action under RCRA or any other laws.

IT IS SO ORDERED.

July 9, 2009
Date


William W. Rice
Acting Regional Administrator
United States Environmental Protection Agency
Region 7


Steven L. Sanders
Senior Counsel

APPENDIX A

STATEMENT OF WORK FOR SITE CHARACTERIZATION ACTIVITIES AT THE HERCULANEUM LEAD SMELTER SITE HERCULANEUM, JEFFERSON COUNTY, MISSOURI

JUNE 2009

The Respondent shall collect samples for lead in the surface soil and gravel driveways of all occupied residential properties in Herculanum, Missouri that are located within a 1 mile radius of the Doe Run lead smelter facility in Herculanum, Missouri. The samples will be collected consistent with the procedures in the attached Quality Assurance Project Plan. All samples will be collected at a depth not to exceed 1 inch. No interior dust samples are required under this sample collection activity.

Where action under this SOW is to be performed in areas owned by, or in possession of, someone other than Respondent, Respondent shall use its best efforts to obtain all necessary access agreements within two (2) days of performing any sampling activities.

The Respondent shall develop a Health and Safety Plan for review by EPA. It shall be implemented during the Work performed under this Order. The Health and Safety Plan shall comply with applicable Occupational Safety and Health Administration regulations.

The Respondent shall begin the sampling activities within 14 days of the effective date of the Order and complete the sampling activities within 60 days of the effective date of the Order.

The Respondent shall transmit the results of the sample analysis to each individual property owner from whose property the sample was collected and shall copy the Project Coordinator and MDNR on these data transmittals. If any of the properties are rental properties the data transmittal will be sent to the renter and the property owner.

The Respondent shall prepare a report summarizing the results of all of the samples collected during this activity. The report shall include at least one map showing the results and locations of all samples collected. The report shall be completed within 90 days of the effective date of the Order.

APPENDIX B

000000 5/19/07
" 8/20/07
" 4/24/09

QUALITY ASSURANCE PROJECT PLAN

FOR A

SITE CHARACTERIZATION AT THE
HERCULANEUM LEAD SMELTER

HERCULANEUM, MISSOURI
CERCLIS ID NO.: MOD006266373

Prepared For:


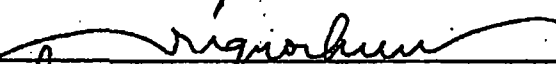
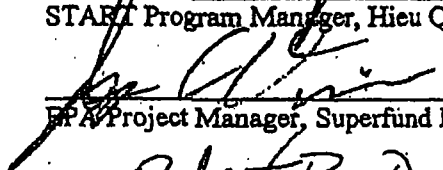
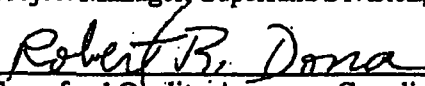
U.S. Environmental Protection Agency Region VII
Superfund Division
901 North 5th Street
Kansas City, Kansas 66101

Prepared By:

USEPA Region VII Superfund Technical Assessment and Response Team (START) 2

September 10, 2001

APPROVED BY:

 START Project Manager, Ryan Schuler	<u>9/11/01</u> Date
 START Program Manager, Hieu Q. Vu, PE, CHMM	<u>9/11/01</u> Date
 EPA Project Manager, Superfund Division, Joe Davis	<u>9-11-01</u> Date
 EPA Superfund Quality Assurance Coordinator, Bob Dona	<u>9/12/01</u> Date

Attachment 4

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ATTACHMENTS

- A Figure 1: Site Location Map
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1.0 PROJECT MANAGEMENT

1.1 DISTRIBUTION LIST

Region VII EPA

Joe Davis, USEPA Project Manager
Bob Dona, USEPA SuperFund Quality Assurance
Coordinator

Region VII START

Ryan Schuler, START Project Manager
Hieu Q. Vu, START Program Manager
Ted Faile, START Quality Assurance Manager

1.2 PROJECT/TASK ORGANIZATION/SCOPE OF WORK

Ryan Schuler, of the U.S. Environmental Protection Agency (USEPA) Region VII Superfund Technical Assessment and Response Team (START), will serve as the START Project Manager for the activities described in this Quality Assurance Project Plan (QAPP) to be conducted at the Herculanum Lead Smelter Site in Herculanum, Missouri. He will be responsible for overall coordination of site activities, ensuring implementation of the QAPP, and providing periodic updates to the client concerning the status of the project, as needed. Joe Davis will be the USEPA Project Manager for this activity.

Eight to ten START members will comprise the field/sampling team. The team will be responsible for assisting EPA with surveying activities, obtaining access to sampling properties, acquisition and calibration of sampling equipment, sample collection, field screening, documentation of residential property conditions and field activities, and coordination of laboratory analyses. The START Quality Assurance (QA) Manager will provide technical assistance, as needed, to ensure that necessary QA issues are adequately addressed.

This QAPP was prepared to address site characterization to determine the extent of soil contamination caused by operations at the Herculanum Lead Smelter (HLS) site in Herculanum, Missouri. In addition, air monitoring stations will be established to document fugitive releases of airborne contaminants. The scope of work includes obtaining property access, surveying/marketing sampling cells at each property, collection of surface soil samples for field screening and laboratory analyses, and collection of ambient air samples at several locations near the HLS site.

Although an attempt will be made to adhere to this QAPP as much as possible, the proposed activities may be altered in the field if warranted by site-specific conditions and/or unforeseen hindrances that prevent any aspect of this QAPP from being implemented in a feasible manner. Such deviations will be recorded in the site logbook as necessary. This QAPP will be available to the field team(s) at all times during sampling activities to serve as a key reference for the proposed activities described herein.

1.3 PROBLEM DEFINITION/BACKGROUND/SITE DESCRIPTION

This QAPP was prepared by the Tetra Tech START to address imminent and long-term concerns that could impact human health and/or the environment at the HLS site (site), where metals-contaminated soils (predominantly lead, cadmium and zinc) have been identified during previous sampling activities.

The HLS site is located at 881 Main Street in Herculaneum, Missouri, about 25 miles south of the St. Louis metropolitan area (see Attachment A - Figure 1: Site Location Map). The site property is approximately 52 acres in size. An approximately 24-acre slag disposal pile is located south of the smelter in a horseshoe bend of Joachim Creek. The slag pile is located in the floodplain of Joachim Creek, in an area classified as a wetland. The smelter site is bordered on the east by the Mississippi River and on the north and west by residential areas. South of the smelter is the slag pile and wetland area. The slag pile is bordered to the east, west, and south by Joachim Creek, and to the north by residential areas and the smelter facility (see Attachment B - Figure 2: Aerial Photography). The slag pile and most of the smelter facility are located in Jefferson County, Section 29, T. 41 N., R. 6 E., although the northern portion of the facility extends into Section 20. Geographic coordinates of the site are 38° 15' 19.0" north latitude and 90° 22' 56.7" west longitude.

The site is an active lead smelter, the largest of its kind in the United States. HLS began operations in 1892 as part of the St. Joseph Lead Company. In 1986, it became part of the newly formed Doe Run Company (Doe Run), a joint venture of the Fluor Corporation and the Homestake Mining Company. In 1990, the Fluor Corporation became the sole owner of Doe Run. The site consists of three main areas: (1) the smelter plant, located on the east side of Main Street; (2) the slag storage pile; and (3) office buildings on the west side of Main Street.

The following major processes occur at the HLS site: (1) sintering, smelting, and refining of lead ore;

(2) sulfuric acid production from waste sulfur-containing gases generated by the sintering operation; and (3) wastewater treatment. The smelting operation generates a molten slag, 20 percent of which is sent to a slag storage pile as waste. The slag pile occupies approximately 24 acres in the floodplain of Joachim Creek, and is up to 40 feet tall in some sections. In 1993, during a major flood event, water reached several feet up the sides of the slag pile. The site also generates stack air emissions from the smelter and fugitive air emissions from various operations (MDNR, 1999).

Several investigations have been conducted at the site, including a Preliminary Assessment/ Screening Site Inspection by the EPA in 1980, a multimedia compliance inspection by the EPA in 1995, a Preliminary Ecological Risk Assessment for Fish and Wildlife Habitats by the U.S. Fish and Wildlife Service (USFWS) in 1998, and a Preliminary Assessment by the Missouri Department of Natural Resources (MDNR) in 1998 and 1999. In addition to these state and federal lead investigations, the facility has collected and submitted to the state a large quantity of environmental data pursuant to Missouri's site-specific State Implementation Plan (SIP) established under the Clean Air Act (CAA), National Pollutant Discharge Elimination System (NPDES) permit, Metallic Minerals Waste Management Act permit, and voluntary soil cleanup efforts in the surrounding Herculaneum community.

Based on previous investigations, primary metal contaminants in the slag pile include arsenic, cadmium, copper, lead, nickel, and zinc. The slag pile has been partially inundated by flood waters in the past. The USFWS identified significant concentrations of lead, cadmium, and zinc in floodplain soils; significant concentrations of lead and zinc in river sediments; and significant zinc concentrations in surface water samples collected from drainage ditches on the Joachim Creek floodplain.

Stack and fugitive emissions from the site, and fall-out from these emissions, have resulted in releases of lead, cadmium, and sulfur dioxide to the air and soil. Since 1980, the smelter's emissions have been regulated under general and site-specific regulation established in the SIP. Lead emissions at one air monitoring station near the site have consistently been above the 1.5 microgram per cubic meter ($\mu\text{g}/\text{m}^3$) National Ambient Air Quality Standard (NAAQS), since it was installed in 1992. Due to the continued noncompliance with the NAAQS standard, new SIP regulations are being developed by the site and MDNR.

Soil sampling has shown lead levels as high as 12,800 parts per million (ppm) in the surface soils of homes surrounding the smelter. A 1992 Jefferson County Health Department study identified 13 homes near the site where children had lead levels greater than 15 micrograms per decaliter (g/dl). Twelve of these 13 homes had lead levels in the soil ranging from 1,000 to 3,500 ppm, and one had lead levels in the soil up to 999 ppm. Thirteen out of 21 birds tested as part of the USFWS study showed clinical or subclinical lead poisoning based on liver analysis. Fish and tissue samples collected during this study had lead concentrations up to 7.5 ppm. Under a groundwater monitoring program conducted at the site since 1980, lead and cadmium concentrations in the groundwater periodically have been found above the respective maximum contaminant levels (MCLs) established under the Safe Drinking Water Act. The MCLs for lead and cadmium are 15 parts per billion (ppb) and 5 ppb, respectively.

In August of 2001, EPA was notified by a Herculanum citizen of a grey powdery substance on the roads in the town. Further investigation identified the substance containing lead at 300,000 ppm or 30%. Additional field screening identified the trucks delivering lead concentrate to the Doe Run Smelter as the likely source of the material along the haul routes in the town.

1.4 PROJECT/TASK DESCRIPTION

The activities described in this QAPP will address the following:

- A. The extent of soil contamination in residential yards, day-care facilities, areas in schoolyards frequented by children, parks, and all other child high-use areas affected by the HLS operations located east of and adjacent to U. S. Highway 61 and north of Joachim Creek in the township of Herculanum. In addition, all residential yards and child high-use areas adjacent to or north of Old Route 61 Highway between the Joachim Creek overpass and U.S. Highway 61 shall be characterized. This includes all residential lots owned by the Doe Run Company and vacant residential lots.
- B. If the results of the site characterization along haul routes conducted in item A above indicate that high levels of surface soil contamination exists beyond the boundaries specified, sampling will be conducted to delineate the extent of this contamination in residential yards, day-care facilities, areas in schoolyards frequented by children, parks, and all other high use

areas affected by the HLS operations.

1.5 QUALITY OBJECTIVES AND CRITERIA FOR MEASUREMENT DATA

The QA objective for this project is to provide valid data of known and documented quality. Specific Data Quality Objectives (DQO's) are discussed in terms of accuracy, precision, completeness, representativeness, and comparability.

For this project, accuracy is defined as the ratio, expressed as a percentage, of a measured value to a true or reference value. The measurement process of a contaminant concentration includes separate field and laboratory measurements. Errors are associated with each of these two types of measurements. These errors will be quantified and expressed as a measure of accuracy. The analytical component of accuracy will be expressed as Percent Recovery based on the analysis of lab-prepared spike samples and Performance Evaluation (PE) audit samples.

Precision for this project is defined as a measure of agreement among individual measurements of the same property and will be expressed via duplicate samples. The overall precision is assessed by collection of duplicate or collocated samples. Approximately 10% of duplicate/collocated samples is anticipated.

Data completeness will be expressed as the percentage of data generated that is considered valid. A completeness goal of 100% will be applied to this project; however, if that goal is not met, site decisions may still be made based on the remaining data. No specific critical samples have been identified for the project.

Representativeness of collected samples is facilitated by establishing and following criteria and procedures identified in this QAPP.

Data comparability is achieved by requiring all data generated for the project be reported in common units. The following table lists the various types of data that will be generated and the specific reporting units.

SPECIFIC DATA REPORTING UNITS	
PARAMETER	UNIT
Metals in Soil by X-ray Fluorescence Spectrometer (XRF)	ppm
Metals in Soil by Laboratory Analysis	milligrams per kilogram (mg/kg)
Metals in Air	micrograms per cubic meter ($\mu\text{g}/\text{m}^3$)
Sampled Air Volume at Standard Temperature and Pressure (STP)	cubic meters at STP (m^3 STP)
Sampling Flowrate at STP	cubic meters per minute at STP (m^3/min STP)
Wind Speed	miles per hour (mph)
Wind Direction (Field Report)	degrees on an azimuth compass
Temperature	degrees Fahrenheit (F)
Barometric Pressure (not corrected to sea level)	millimeters of mercury (mm Hg)
Time	military time (00:00 - 24:00)
Date	month/day/year

1.6 SPECIAL TRAINING REQUIREMENTS/CERTIFICATION

All site personnel will be required to have completed a basic 40-hour health and safety (Hazardous Waste Operations and Emergency Response [HAZWOPER]) training course and annual refreshers. Familiarization with the Niton™ XRF and its operating procedures will also be necessary for the START members.

1.7 DOCUMENTATION AND RECORDS

START personnel will maintain a field logbook to record all pertinent activities associated with the sampling events. Appropriate documentation pertaining to photographs taken by START will also be recorded in the field logbook. Information pertaining to all samples (i.e., sampling dates/times, locations, etc.) collected during this event will be recorded on sample field sheets generated by START. Labels generated by START will be affixed to sample containers, identifying sample numbers, dates collected, and requested analyses. Chain of custody records will be completed/maintained for all samples from the time of their collection until they are submitted to the laboratory for analysis.

A health and safety plan will be prepared by START prior to the field activities that will address site-specific hazards. The health and safety plan will be reviewed and signed by all field personnel prior to field work, indicating that they understand the plan and its requirements. Copies of the plan will be available to all personnel throughout the sampling activities.

2.0 MEASUREMENT/DATA ACQUISITION

2.1 SAMPLING PROCESS DESIGN

The proposed sampling scheme for this project will be in accordance with the Removal Program Representative Sampling Guidance, Volume 1: Soil, OSWER Directive 9360.4-10, November 1991, and judgmental (based on the best professional judgement of the sampling team). The sampling design proposed in the following paragraphs has been selected to identify the extent of soil contamination at the site. The proposed number of samples is a balance between cost and coverage and represents a reasonable attempt to meet the study objectives while staying within the budget constraints of a typical site investigation.

The characterization sampling will be conducted in a priority hierarchy as follows:

1. Residential yards where a known child under 7 years old resides.
2. Residential yards along the primary and secondary concentrate haul routes.
3. Child high use areas.

At a minimum, residential properties located in the previously identified area will have four quadrants established around the home, which will radiate out 50 feet from each side of the home. In each quadrant, a nine-aliquot composite sample will be collected from the upper 1 inch of soil and screened with a Niton™ XRF. Therefore, a minimum of 4 four samples will be collected from each residential property. Soil samples will not be collected from within 3 feet of the residential dwellings to reduce the potential lead-based paint contribution to soil-lead concentrations. In addition, multi-aliquot surface soil samples will be taken at the drip line of each structure where a child under 6 years old with elevated blood lead is known to reside. Multi-aliquot surface soil samples will also be collected from any play areas, gardens, sand piles, unpaved driveways, and other areas appearing to be frequented by children. The number of aliquots for these areas will be dependent upon size, but, in general, will follow the

aliquot density used for the quadrants.

A 9-aliquot soil sample will be collected from the five-foot section of residential yards and high child use areas adjacent to roads used as haul routes by the Doe Run Company and within the first 50 yards of the streets intersecting with those haul routes.

In addition to soil sampling at residential properties, indoor dust samples will be collected at residential homes which meet the one of the following criteria: 1) homes which have a child less than 6 years of age; and 2) homes which have an XRF screening concentration of greater than 10,000 ppm from any area of the yard.

For locations where there are no residences, a center point, depicting a possible future building site, will be established and flagged. From the center point, four quadrants will be established, which will radiate out 100 feet in each compass direction, and the aforementioned sampling protocols will be completed (e.g. collecting a nine-aliquot composite from each quadrant).

If the results of the screening characterization conducted indicate that surface soil contamination exists (i.e., lead concentrations greater than 400 ppm) beyond the specified limits, further sampling will be conducted on properties beyond the defined sampling.

In addition to soil sampling, four to five ambient air sampling apparatus will be established at several locations near the smelter to determine the potential impact of transporting lead materials from and to the smelter. Specific monitoring locations will be based on field judgment. The monitoring locations will include high traffic and low traffic areas, in order to study any differences. The sampling apparatus will include Hi-Vol and PM-10 Hi-Vol air monitoring instruments. The air monitoring instruments will be placed on the ground. At least one Hi-Vol and one PM-10 Hi-Vol will be collocated at one location.

A summary of anticipated samples to be collected for this project is provided in the following table. The exact number will depend on field screening results, as previously described. Approximately 10 percent of all screening samples will be collected for laboratory confirmation analysis.

Matrix	Number of Samples		Laboratory Analyses ¹
	Field Screening (Lead)	Laboratory	
Soil	4000	400	Lead, cadmium, arsenic, zinc, nickel
Dust	NA	250	Lead, cadmium, arsenic, zinc, nickel
Air	NA	200	Lead, cadmium, arsenic, zinc, nickel

NA = Not Applicable

¹ See Section 2.4 for details pertaining to analyses.

2.2 SAMPLING METHODS REQUIREMENTS

Soil samples will be collected following the EPA Region 7 SOP #2231.12A: ERT #2012; "Soil Sampling". Confirmation soil samples will be collected with a clean, dedicated stainless steel spoon and homogenized in a clean, dedicated aluminum pie pan. The samples will be screened with the XRF after homogenizing the soil, and three consecutive XRF readings will be collected. The three homogenized XRF readings will be recorded on a field sheet. Screening samples using the XRF will follow EPA Region 7 SOP # 4231.707A. The location of the XRF readings (as well as confirmation sample location, if necessary) will also be recorded on each field sheet. Confirmation samples will be transferred directly into the appropriate container for analysis. The samples will be submitted to a subcontracted laboratory.

Indoor dust sampling will be conducted in accordance with EPA Region 7 SOP #4231.11A with a minor modification to include the use of a hand-held electric vacuum sweeper. A dedicated filter will be used for each sample. The dust sample will be collected from an adequate area to provide a minimum of 5 grams of weight. The sampling area will include high traffic areas, children bedrooms, and/or undisturbed areas. Pertinent sampling information will be documented on field sheets. The dust sample will be transferred directly into a dedicated ziplock bag and labeled for laboratory analysis.

All ambient air sampling will be accomplished using Hi-Vol and PM-10 Hi-Vol Air Samplers (manufactured by General Metals Work, Inc., Village of Cleves, Ohio), or equivalent. The samplers will be operated in accordance with EPA Region 7 SOP No. 2314.1A and No. 2314.2A except where procedures differ from this QAPP. In all cases, the policies described in this QAPP shall take precedence over other EPA SOPs. Each sampler will be positioned on the ground level. Suitable supporting structures meeting all local and Federal safety codes will be used. Samplers will be operated

continuously for a 24-hour ($\pm 10\%$) sampling duration. Sampler start and completion times will be referenced to 2400 hours.

Air samples may be voided by the EPA OSC or START Project Manager under the following conditions:

(1) If the sampling duration is outside the 21.6 to 26.4 hour limit; (2) evidence of sample tampering is observed; or (3) sample is known to be unrepresentative (due to contamination, sampler failure, etc.).

One meteorological station will be established for the air monitoring. The station will be sited and operated in accordance with "Quality Assurance Handbook for Air Pollution Measurement Systems: Volume IV Meteorological Measurements", EPA-600/4-82-060, August 1989. Specifically, the station will measure wind direction, wind speed, and temperature from a height of 10 meters. Data logging will be accomplished electronically using an averaging time of 1 hour. Surface pressure (not corrected to sea level) will be recorded hourly. If larger scale meteorological data are required, such "synoptic" data will be acquired from the nearest US Geological Survey stream recording station or from the nearest reporting airport.

Disposal of investigation-derived wastes (IDW) and procedures for equipment/personal decontamination will be addressed in a site-specific health and safety plan prepared by the Tetra Tech START. In general, it is anticipated that most IDW will consist of disposable sampling supplies (gloves, paper towels, etc.) that will be disposed of off-site as uncontaminated debris.

2.3 SAMPLE HANDLING AND CUSTODY REQUIREMENTS

Samples will be collected in accordance with procedures defined in Region VII EPA SOP 2130.4B.

Chain of custody procedures will be maintained as directed by Region VII EPA SOP 2130.2A. Samples will be accepted by the contracted laboratory according to their specific procedures and SOPs.

All soil sample containers will be placed in plastic bags to control spillage in case the containers break during shipment. Soil and dust samples will be placed in coolers containing packing material and enough ice to ensure that the temperature of the samples does not exceed 4 C. Necessary paperwork for all samples, including chain of custody records, will be completed by the Tetra Tech START and

maintained with the coolers until delivery to the laboratory. If shipment of the samples is required via commercial service, each cooler lid will be securely taped shut, and two custody seals will be signed/dated and placed across the lid opening. The samples will be submitted to the receiving laboratory by START personnel in a time-efficient manner to ensure that the applicable holding times are not exceeded.

2.4 ANALYTICAL METHODS REQUIREMENTS

The samples will be analyzed at a pre-qualified laboratory contracted by the Tetra Tech START, according to the EPA methods listed in the following table. Detection limits that are typically reported by those methods are expected to be adequate for this activity. The requested analyses have been selected based on past sampling data and historical information collected for the site:

ANALYTICAL METHODS	
Analytical Parameter ¹	EPA Method Number
SOIL/DUST	
Lead, cadmium, arsenic, zinc, nickel	SW846 Method 6010B
AIR	
Lead, cadmium, arsenic, zinc, nickel	SW846 Method 6010 B and 7000 Series

¹ EPA may cease the analysis for zinc and nickel content if zinc and nickel concentrations in the initial confirmation samples are consistently below MDNR's Any Use Soil Levels.

2.5 QUALITY CONTROL REQUIREMENTS

Because dedicated supplies will be used for all samples (i.e., stainless steel spoons, pie pans, etc.), no QC samples will be required to assess the potential for cross-contamination. Analytical error (precision and accuracy) will be determined by the analysis of laboratory-prepared duplicates and spike samples. These criteria, along with other laboratory QC elements, will be performed in accordance with the contract laboratory's quality assurance plan.

To satisfy the quality control elements for the XRF, data will be collected and analyzed for comparability to laboratory data, to determine detection and quantitation limits, and to determine accuracy and precision. The mean of the three XRF readings taken for each confirmation sample will be compared

statistically to the laboratory results for each confirmation sample to assess comparability. The measure of agreement (r^2) for the XRF unit should be above 0.7 or greater for the XRF data to be considered screening level data.

For every measurement, the Niton™ gives an uncertainty range that represents a 95 percent confidence interval. In general, precision/accuracy increases with increasing sample run time. Due to preliminary sample results indicating high lead levels, XRF sample run time will be increased accordingly to improve precision and accuracy. The goal is for samples to be screened long enough to obtain precision measurements within 20% of the actual concentrations.

2.6 INSTRUMENT/EQUIPMENT TESTING, INSPECTION, AND MAINTENANCE REQUIREMENTS

Testing, inspection, and maintenance of all sampling equipment and supplies, along with field screening instrumentation, will be performed by START personnel prior to deployment for field activities. Testing, inspection, and maintenance of analytical instrumentation will be performed in accordance with the contracted laboratory's analytical SOPs and manufacturers' recommendations.

2.7 INSTRUMENT CALIBRATION AND FREQUENCY

Calibration of the field screening and laboratory analytical instrumentation will be in accordance with the referenced SOPs and manufacturers' recommendations.

2.8 INSPECTION/ACCEPTANCE REQUIREMENTS FOR SUPPLIES AND CONSUMABLES

All sample containers will meet EPA criteria for cleaning procedures required for low-level chemical analysis. Sample containers will have Level II certifications provided by the manufacturer in accordance with pre-cleaning criteria established by EPA in *Specifications and Guidelines for Obtaining Contaminant-Free Sample Containers*. The certificates of cleanliness will be maintained in the project file.

2.9 DATA ACQUISITION REQUIREMENTS

Previous data/information pertaining to the site (including other analytical data, reports, photos, maps, etc., which are referenced in this QAPP) have been compiled by START from various sources. Some of that data has not been verified; however, that information will not be used for decision-making purposes without verification of its authenticity.

2.10 DATA MANAGEMENT

All laboratory data will be managed as specified in the contract laboratory's QAM. Preliminary data will be received by the project manager on site. The final data package will be forwarded to a chemist trained in data validation to complete the validation process. The results will be summarized and included in the report submitted to EPA.

3.0 ASSESSMENT/OVERSIGHT

3.1 ASSESSMENTS AND RESPONSE ACTIONS

Assessment and response actions pertaining to analytical phases of the project are addressed in the contracted laboratory's quality assurance manual(s). Because of the short duration of this sampling event, no field audits of sampling procedures will be performed. Corrective actions will be taken at the discretion of the EPA Project Manager, whenever there appears to be problems that could adversely affect data quality and/or resulting decisions affecting future response actions pertaining to the site.

3.2 REPORTS TO MANAGEMENT

A letter report describing the sampling techniques, locations, problems encountered (with resolutions to those problems), and interpretation of analytical results will be prepared by START, following completion of the field activities described herein and validation of laboratory data. The laboratory data for soil samples will be compared to all applicable or relevant and appropriate requirements (ARARs), including removal action levels that have been established for the site, to determine whether further response is warranted.

4.0 DATA VALIDATION AND USABILITY

4.1 DATA REVIEW, VALIDATION, AND VERIFICATION REQUIREMENTS

Data review and verification will be performed by a qualified laboratory analyst and the laboratory's section manager in accordance with the contracted lab's quality assurance program. Follow-up validation of the data will be performed by a Tetra Tech START chemist. The START Project Manager will be responsible for overall validation and final approval of the data, in accordance with the projected use of the results.

4.2 VALIDATION AND VERIFICATION METHODS

A qualified Tetra Tech START chemist will review the data for laboratory spikes/duplicates and laboratory blanks to ensure that they are acceptable. The START Project Manager will inspect the data to provide a final review. The START Project Manager will also compare the sample descriptions with the field sheets for consistency and will ensure that any anomalies in the data are appropriately documented.

4.3 RECONCILIATION WITH USER REQUIREMENTS

If data quality indicators do not meet the project's requirements as outlined in this QAPP, the data may be discarded, and re-sampling and/or re-analysis may be required.

ATTACHMENT A
Figure 1: Site Location Map
(One page)



Herculaneum Lead Smelter
Herculaneum, Missouri

Figure 1
Site Location Map



Tetra Tech EM Inc.

Date: 9/10/01

Drawn By: Cole Mills

Project No: 68011.L.01.0027.00

ATTACHMENT B

Figure 2: Aerial Photography

(One page)



Not to Scale

Herculaneum Lead Smelter
Herculaneum, Missouri

Figure 2
Aerial Photography



Tetra Tech EM Inc.

Source: USGS Aerial Photo & CARES Internet Map Server,
University of Missouri-Columbia

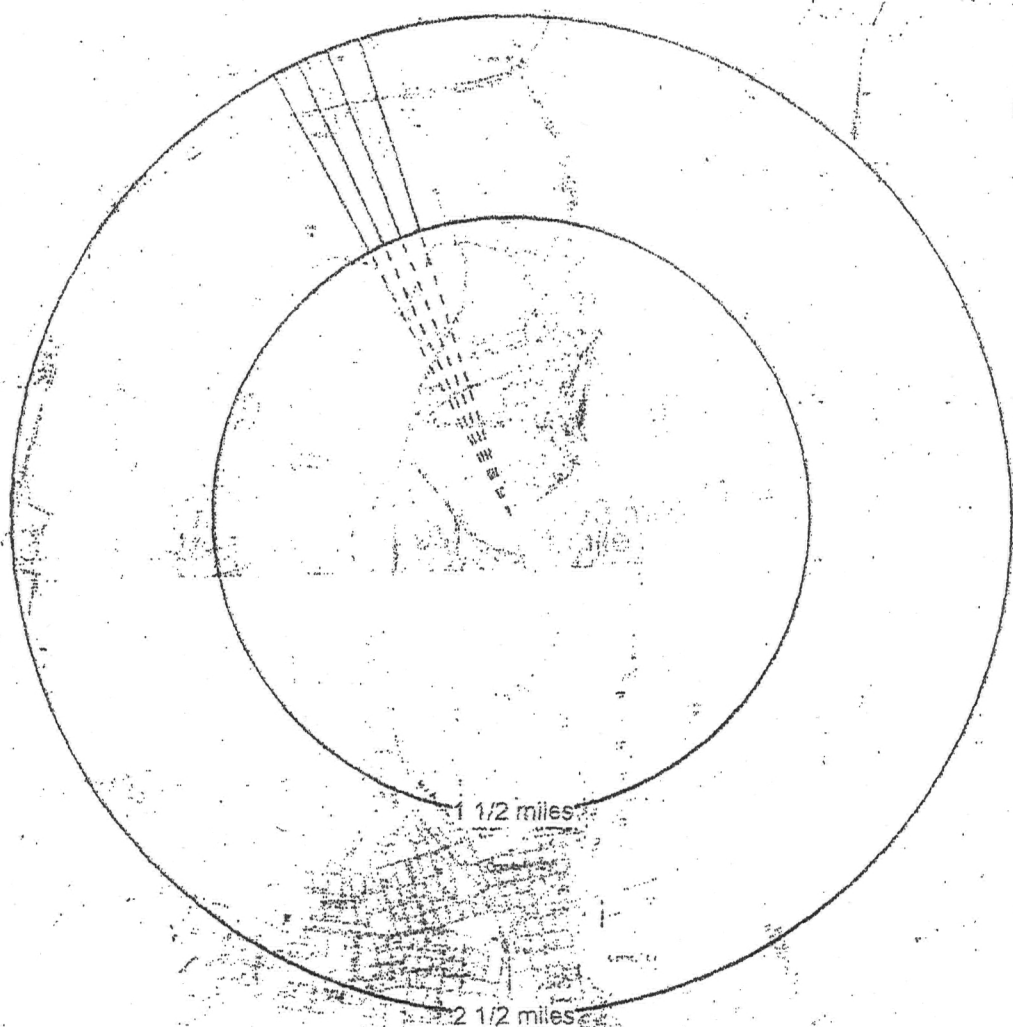
Date: 9/10/01

Drawn By: Colin Watts




Project No: G0011.L.01.0027.00

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ATTACHMENT C
Figure 3: Sampling Map
(One page)



Legend

-  Radius rings
-  Transect lines
-  Transect lines where sampling will occur



Not to Scale

Note: Samples will be taken every 200 hundred feet along the transect lines between the 1 1/2 miles radius ring and the 2 1/2 miles radius ring.

Source: USGS Festus, MO 7.5 Minute Topo Quad

Herculaneum Lead Smelter
Herculaneum, Missouri

Figure 3
Sampling Map



Tetra Tech EM Inc.

V:\START 2 (09011)\Tech 0027 - Herculaneum Lead Smelter\Figures\Figure 3.FH10

**ADDENDUM TO THE QUALITY ASSURANCE PROJECT PLAN (QAPP)
FOR THE HERCULANEUM LEAD SMELTER SITE
HERCULANEUM, MISSOURI
Task Order No. 0027**

This document serves as an addendum to the Quality Assurance Project Plan (QAPP) for the Herculanum Lead Smelter (HLS) site, where removal activities are currently being conducted at residential properties within the City of Herculanum. Removal activities outside each home involve the excavation of lead-contaminated soil, the placement of clean backfill, and the re-seeding of grass at the property. Following these outdoor activities, the abatement of lead-contaminated dust inside the home is being initiated. This QAPP addendum addresses screening/sampling of home interiors at which removal activities have already taken place to assess the potential for recontamination due to on-going operations at the HLS site. The data generated during this sampling program will also be used by EPA to evaluate the need for additional measures/procedures to be taken during the abatement of lead-contaminated dust inside the homes.

Tetra Tech START is currently monitoring the concentrations of lead within backfill soil at 10 residences where outdoor removal activities have been completed. This monitoring is being conducted on a monthly basis to evaluate the extent of recontamination of those properties. The initial (baseline) sampling event occurred in February 2002. Tetra Tech START is performing a statistical study of the data generated during this baseline sampling event to determine a statistically representative number of residence interiors to be sampled. This study will be performed in accordance with the guidelines established in the following documents: *Guidance for Data Quality Assessment: Practical Methods for Data Analysis*, EPA QA/G-9, QA00 Version (EPA 2000) and *Statistical Methods for Evaluating the Attainment of Cleanup Standards* (EPA 1989). The variability of the data generated during the baseline sampling event will be used to establish the number of residences to be sampled. It is anticipated that the sampling of 15 to 20 residences will generate a data set that is statistically representative of the area with a level of confidence of 90 percent.

The interior of each residence will be sampled on a monthly basis. At this time, the duration of this sampling program has not been determined, although it is anticipated to last about 12 months. All residences with children with known elevated blood levels for lead will be sampled. Selecting the remaining residences to be sampled will be based on the following criteria: 1) residences with children

under 6 years of age; 2) statistical representativeness of the area to address the recontamination issue; and 3) access granted by the homeowner(s). Wipe and dust samples are to be collected from each residence on a monthly basis. The initial sampling event will also include screening for lead-based paint (LBP) at each residence and the collection of wipe and dust samples from the personal vehicles of five homeowners. Also, carpet samples will be collected from five residences and submitted to the contracted laboratory for analysis. The sampling protocols are presented in the following sections.

Wipe Samples

Five wipe samples will be collected from non-porous surfaces in each residence during each sampling event. The sampling locations will typically include three floors and two window sills within the home. If young children are present in the home, every effort will be made to collect samples from common areas used by the children and from the children's bedroom(s). Templates of known area (1 square foot [sq ft] for floors and 0.25 sq ft for window sills) will be used during sampling to assure the representativeness of the data collected.

As previously stated, wipe samples will also be collected from the personal vehicles of five homeowners. A 0.25-sq ft template will be used to collect a wipe sample from the dashboard of each automobile.

The sampling procedure for wipe samples will follow the guidelines set forth in the EPA *Residential Sampling for Lead: Protocols for Dust and Soil Sampling - Final Report* (EPA 1995). All wipe samples will be submitted to the laboratory for analysis of arsenic, cadmium, lead, nickel, and zinc by EPA Method 6020. Contaminant levels will be expressed in micrograms per sq ft ($\mu\text{g}/\text{ft}^2$), which will represent the contaminant loading at each sampling location. The anticipated number of field samples, quality control (QC) samples, and method of analysis are summarized in Table 1.

Dust Samples

One dust sample will be collected and submitted for analysis from a carpeted floor in each residence during each sampling event. A vacuum cleaner equipped with a high efficiency particulate air (HEPA) filter will be used to collect a dust sample from a high-traffic area in each residence. A template (1 sq ft) will be used at each sampling location to assure the representativeness of the data collected. If sufficient sample volume is not collected from the sampling area, additional material will be collected from an adjacent area of the same size.

As stated above, dust samples will also be collected from the personal vehicles of five homeowners. Each sample will be collected from the driver-side floorboard. If a non-porous (e.g., rubber or vinyl) floormat is present, the sample will be collected from the carpeting adjacent to the floormat. If an upholstered floormat is present, the sample will be collected from the floormat itself.

The dust samples will be collected according to general procedures described in Region 7 SOP 4231.11A (modified to incorporate the use of a HEPA vacuum). Samples will be submitted to the laboratory for the analysis of arsenic, cadmium, lead, nickel, and zinc by EPA Method 6020. The contaminant levels will be expressed in micrograms per kilogram ($\mu\text{g/kg}$), which will represent the total concentration of each contaminant, and $\mu\text{g/ft}^2$, which will represent the contaminant loading at each sampling location. The anticipated number of field samples and method of analysis are summarized in Table 1.

Lead-Based Paint Screening

During the initial sampling event, screening of potential LBP surfaces inside each residence will be conducted. This screening will be performed in each room of the residence and will follow the protocol established in U.S. Department of Housing and Urban Development (HUD) *Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing* (HUD 1997). An x-ray fluorescence spectrometer will be used to collect the readings from each painted surface. For QC purposes, duplicate readings will be collected at a frequency of 10 percent.

Carpet Samples

After a review of the dust sampling data generated during the initial sampling event, carpet samples will be collected from five residences. Upon approval from the homeowner, a 1-square-inch sample of carpet will be removed from a high-traffic area and a low-traffic area within each residence. New carpet will be installed by an independent contractor after the collection of these samples. In order to limit the area requiring new carpeting, sampling locations will be selected in smaller areas/rooms within each residence, such as a hallway or child's bedroom. The old carpeting will be removed and the underlayment cleaned by a licensed lead abatement contractor prior to the installation of the new carpeting. The carpet samples will be submitted to the laboratory for analysis of arsenic, cadmium, lead, nickel, and zinc by EPA Method 6020. The number of field samples and method of analysis are summarized in Table 1.

Table 1
Samples Submitted for Laboratory Analysis
Interior Recontamination Sampling at the Herculaneum Lead Smelter Site
Herculaneum, Missouri

Field Sample	Quantity of Samples	Quality Control Samples and Frequency	Analytical Method and Units of Data
Wipe Samples			
Residences	1200 ¹	Field Blanks ² - 5%	EPA 6020 - micrograms per square foot ($\mu\text{g}/\text{ft}^2$)
Personal Vehicles	5	N/A	EPA 6020 - $\mu\text{g}/\text{ft}^2$
Dust Samples			
Residences	240 ³	Equipment Blank ⁴ - 1	EPA 6020 - $\mu\text{g}/\text{ft}^2$ and micrograms per kilogram ($\mu\text{g}/\text{kg}$)
Personal Vehicles	5	N/A	EPA 6020 - $\mu\text{g}/\text{ft}^2$ and $\mu\text{g}/\text{kg}$
Carpet Samples			
Residences	10	N/A	EPA 6020 - $\mu\text{g}/\text{ft}^2$ and $\mu\text{g}/\text{kg}$

NOTES

1. Sample quantity is based on 5 samples/residence x 20 residences sampled x 12 sampling events.
2. Field blanks will be collected by inserting a clean, unused wipe into a sample container.
3. Sample quantity is based on 1 sample/residence x 20 residences sampled x 12 sampling events.
4. During the initial sampling event, a clean, unused HEPA filter will be submitted to the laboratory for analysis.

David L. May
for Ryan Schuler, START 2 Project Manager

3/19/02
Date

Ted Faile
Ted Faile, CHMM, START 2 Quality Assurance Manager

3/19/02
Date

Bruce A. Morrison
Bruce Morrison, Region 7 Superfund Division, EPA Project Manager

3/19/02
Date

Robert B. Dona
Bob Dona, Region 7 Superfund Division, Quality Assurance Coordinator

3/20/02
Date

Draft
July 28, 2003
Standard Operating Procedure
For
Road Sampling
At the
Herculaneum Lead Smelter Site, Herculaneum, MO

Equipment Used

HEPA Vacuum VACOMEGA
Dust Collection Sample Filter
Inlet Nozzle 1.245" x 4"
Power Inverter 1000/2000 Watt
24 feet of Battery Wire Cable
Vehicle and Battery to Supply Power

Model # 950-AI-00-120
Part No. FAB-07-03-006PS
Part No. 924-MV-18-004N

6 gauge

Setup

1. Equipment is gathered and the vehicle is prepared for sampling.
2. The 24 foot Battery Wire Cable is connected to the vehicle battery, run over the top of the vehicle and through the rear driver side window.
3. The Battery Wire Cable is connected to the Power Inverter.
4. The VACOMEGA's power is turned on to assure that the vacuum is functioning properly.

Filter Preparation

At each sampling location, one new pre-weighed Dust Collection Sample Filter and Inlet Nozzle are used. At the open end of the vacuum hose, a filter is folded and inserted into the open end of the vacuum hose. The blue sides of the filter are rolled down so the paper portion of the filter is even with the top hose. The inlet nozzle is then inserted over the end of the vacuum hose to secure the filter.

Sample Location

At each known sampling location, the vehicle is parked facing the direction of oncoming traffic and the vehicle remains running while the sample is taken. With the known recorded filter loaded in the vacuum hose the vacuum is switched on to collect the sample. The 3 feet by 3 feet sample area is then vacuumed one time over to pick up all road dust that has settled in the sample area. At the end of the sampling, the vacuum nozzle is turned upright (so the filter is turned upright) and the power is turned off. The inlet nozzle is taken off and the filter is pulled out of the vacuum hose. The filter is then rolled up and placed into its properly labeled sample container.

This procedure is completed at each sampling location. At the end of each sampling event, samples are recorded in the sample management book, labeled, and chains of custody are completed for shipment to the laboratory

At the Laboratory, EPA SW-846 Method 3050B is used in the digestion process. Analysis is completed by inductively coupled argon plasma spectrometry - mass spectrometry (ICP-MS) using EPA SW-846 Method 6020A. The units reported by the laboratory are in milligrams per kilogram (ppm), and since the hepa filters are pre-weighed, units are also reported in milligrams per square foot.



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION VII
901 NORTH 5TH STREET
KANSAS CITY, KANSAS 66101

MAY 09 2007

MEMORANDUM

SUBJECT: Addendum to the Quality Assurance Project Plan (QAPP) for Site Characterization for the Herculaneum Lead Smelter Superfund Site

FROM: Bruce A. Morrison, RPM 
SUPR/FFSE

TO: EPA Quality Assurance Branch

This Memorandum is intended to supersede the previous addendum approved on September 5, 2006.

At the Herculaneum Lead Smelter Superfund Site surface soil samples are collected in accordance with the September 10, 2001, Quality Assurance Project Plan which states that samples are to "be collected from the upper 1 inch of soil". In practice, since the inception of the 2001 QAPP, EPA's samples are collected from the upper portion of the 1 inch soil horizon so as to ensure that a depth of 1 inch is not exceeded because exact measuring devices are not used when collecting sample aliquots.

MEMORANDUM

SUBJECT: Addendum to the Quality Assurance Project Plan for Site Characterization for the Herculaneum Lead Smelter Superfund Site

FROM: Bruce A. Morrison
Project Manager

TO: EPA Quality Assurance Branch

At the Herculaneum Lead Smelter Superfund Site, soil samples were previously collected into bags. Soil samples were homogenized either in the bag or in an aluminum pan, depending on the volume and texture. Samples were then analyzed with the XRF without any sample preparation other than homogenization.

Beginning in November 2006, sample preparation prior to analysis was adjusted. After collection, samples are placed into pans and allowed to completely air dry. Once dry, the soil is homogenized and passed through a number 10 sieve. An XRF is then used to analyze the fine portion of the sample.

Bruce A. Morrison
Bruce Morrison, Project Manager

8/20/07
Date

Diane Harris
Diane Harris, Regional Quality Assurance Manager

08/20/2007
Date

2007216
RECEIVED

AUG 20 2007

MEMORANDUM

April, 24, 2009

**SUBJECT: Street Dust Sampling Modification at Site Characterization for the
Herculaneum Lead Smelter Superfund Site**

**FROM: Bruce A. Morrison, RPM
SPEB/SUPR**

TO: EPA – Superfund Site File

At the Herculaneum Lead Smelter Superfund Site, The Quality Assurance Sampling Plan (QAPP) states that street samples will be collected for the first 50 yards of side streets leading from primary haul routes. This sampling is no longer being performed, and is not necessary for evaluating the effectiveness of vehicle washing at the Doe Run facilities.

